WHAT IS CLAIMED IS:

1. A mobile body discrimination apparatus comprising a plurality of transponders and an interrogator apparatus, said interrogator apparatus having:

at least one antenna;

control means;

transmitting means controlled by said control means for driving said antenna to periodically transmit a transmission start command code conveyed by modulated radio waves, directed at respective ones of said transponders which are currently within a communication region of said antenna, and for transmitting CW (continuous-wave) radio waves in intervals between transmissions of said transmission start command code;

receiving means coupled to said antenna, for obtaining said requested signals from said transponders, conveyed by modulated reflected radio waves from said transponders which are within said communication region; and

each of said transponders having:

an antenna;

rectifier circuit means coupled to said antenna, for converting a signal received by said antenna to a supply of electrical power for operating respective circuits of said transponder;

receiving means coupled to said antenna, for obtaining said transmission start command code from said modulated radio waves transmitted by said interrogator apparatus;

memory means having data stored therein;

modulator means controllable for varying a reflection condition of said antenna with respect to incident radio waves; and

response timing control means responsive to reception of said transmission start command code by said receiving means for controlling said modulator means to vary said reflection condition of said antenna according to response data constituted by at least a part of said data of said memory means, to generate modulated reflected radio waves conveying said response data after a specific delay time has elapsed following reception of said transmission start command code;

wherein said response timing control means comprises means for setting a randomly determined value of said delay time, at each reception of said transmission start command code.

2. The mobile body discrimination apparatus according to claim 1, wherein in said interrogator apparatus:

said at least one antenna comprises a first antenna and second antenna, and

said transmitting means includes first transmitting means controlled by said control means for driving said first antenna to periodically transmit said transmission start command code conveyed by modulated radio waves during and to transmit CW radio waves in intervals between said transmissions of said transmission start command code, and second transmitting means for driving said second antenna to transmit said CW radio waves;

wherein said control means includes means for periodically interrupting said transmission of said CW radio waves by said second transmitting means and second antenna, for the duration of each of respective time intervals in which said transmission start command code is transmitted by said first transmitting means and first antenna.

3. The mobile body discrimination apparatus according to claim 2, wherein a communication region of said first antenna and a communication region of said second antenna overlap one another to form a common communication region.

4. The mobile body discrimination apparatus according to claim 2, wherein said plurality of transponders move continuously or intermittently in a fixed direction along a fixed path, and wherein a communication region of said first antenna and a communication region of said second antenna are positioned such as to partially overlap one another, and are respectively located on said fixed path at a succeeding position and at a preceding position with respect to said fixed direction.

5. A mobile body discrimination system incorporating an interrogator apparatus and a plurality of transponders according to claim 3, with said first and second antennas of said interrogator apparatus spaced apart at respective fixed locations, the system comprising:

conveyer belt transport means for transporting a plurality of load items along a fixed path in a fixed direction such as to pass through said common communication region of said first and second antennas, with each of said transponders being attached to a corresponding one of said load items and with at least a part of said data stored in said memory means of said

each transponder being data relating to said corresponding load item.

6. A mobile body discrimination system incorporating an interrogator apparatus and a plurality of transponders according to claim 3, the system including transport means for transporting a plurality of load items along a fixed path in a fixed direction such as to pass through said common communication region of said first and second antennas, with each of said transponders being attached to a corresponding one of said load items and with at least a part of said data stored in said memory means of said each transponder being data relating to said corresponding load item, comprising:

a housing formed of a material which performs shielding of electromagnetic waves and is formed with a central aperture adapted to permit transfer of said load items by said transport means through said central aperture;

wherein said first antenna and second antenna are attached within said housing, at respective positions located on the periphery of said central aperture, respectively oriented such as to form said common communication region within said central aperture.

7. A mobile body discrimination system incorporating an interrogator apparatus and a plurality of transponders according to claim 3, with said first and second antennas of said interrogator apparatus spaced apart at respective fixed locations, the system comprising:

a plurality of transport vehicles controllable for transporting respective pluralities of load items along a fixed path in a fixed direction such as to pass through said common communication region of said first and second antennas, with each of said transponders being attached to a corresponding one of said load items and with at least a part of said data stored in said memory means of said each transponder being data relating to said corresponding load item.

8. A mobile body discrimination system incorporating an interrogator apparatus and a plurality of transponders according to claim 4, with said first and second antennas of said interrogator apparatus spaced apart at respective fixed locations, the system comprising:

conveyer belt transport means for transporting a plurality of load items along a fixed path in a fixed

direction such as to pass first through said communication region of said second antenna then through said communication region of said first antenna, with each of said transponders being attached to a corresponding one of said load items and with at least a part of said data stored in said memory means of said each transponder being data relating to said corresponding load item.

9. A mobile body discrimination system incorporating an interrogator apparatus and a plurality of transponders according to claim 4, the system including transport means for transporting a plurality of load items along a fixed path in a fixed direction such as to pass successively through said communication region of said second antenna then through said communication region of said first antenna, with each of said transponders being attached to a corresponding one of said load items and with at least a part of said data stored in said memory means of said each transponder being data relating to said corresponding load item, comprising:

a housing formed of a material which performs shielding of electromagnetic waves and is formed with a central aperture adapted to permit transfer of said

load items by said transport means through said central aperture;

wherein said first antenna and second antenna are attached within said housing, at positions on the periphery of said central aperture, respectively oriented such as to form said first communication region and second communication region within said central aperture.

10. A mobile body discrimination system incorporating an interrogator apparatus and a plurality of transponders according to claim 4, with said first and second antennas of said interrogator apparatus spaced apart at respective fixed locations, the system comprising:

a plurality of transport vehicles controllable for transporting respective pluralities of load items along a fixed path in a fixed direction such as to pass successively through said communication region of said second antenna then through said communication region of said second antenna, with each of said transponders being attached to a corresponding one of said load items and with at least a part of said data stored in said memory means of said each transponder being data relating to said corresponding load item.

11. A mobile body discrimination system incorporating an interrogator apparatus and a plurality of transponders according to claim 3, wherein:

said interrogator apparatus is adapted to be portable by an individual;

said system comprises supporting means for supporting a plurality of articles on one side of a common vertical plane, with each of said transponders being attached to a corresponding one of said articles and with at least a part of said data stored in said memory means of said each transponder being data relating to said corresponding article; and

each of said transponders is oriented substantially facing towards said common vertical plane, for thereby enabling said transponders to be successively scanned by manually orienting said antennas of said interrogator apparatus towards said transponders while moving said interrogator apparatus in a direction parallel to said common vertical plane.

12. A mobile body discrimination system incorporating an interrogator apparatus and a plurality of transponders according to claim 3, comprising:

supporting means for supporting a plurality of articles on one side of a common vertical plane, with each of said transponders being attached to a corresponding one of said articles and each of said transponders oriented substantially facing towards said common vertical plane, and with at least a part of said data stored in said memory means of said each transponder being data relating to said corresponding article; and

a movable supporting mechanism operable for moving said interrogator apparatus in directions parallel to said common vertical plane with said antennas of said interrogator apparatus oriented towards said common vertical plane, for thereby enabling said transponders to be successively scanned by said interrogator apparatus.

13. A mobile body discrimination system according to claim 12, comprising a computer system for automatically controlling said movement of said interrogator apparatus by said movable supporting mechanism.

14. The mobile body discrimination apparatus according to claim 1, wherein in said interrogator apparatus:

said at least one antenna comprises a first antenna and second antenna; said transmitting means includes first transmitting means controlled by said control means to periodically drive said first antenna to transmit modulated radio waves conveying a transmission start command code and to drive said first antenna to transmit spread spectrum radio waves which have been generated using a first pseudo-noise code sequence during intervals between transmitting said transmission start command code, and second transmitting means controlled by said control means to periodically drive said second antenna to transmit modulated radio waves conveying said transmission start command code, and to drive said second antenna to transmit spread spectrum radio waves which have been generated using a second pseudo-noise code sequence which is different from said first pseudo-noise code sequence, during intervals between transmitting said transmission start command code; and

said receiving means includes first receiving means coupled to said first antenna, for obtaining said requested signals from said transponders, conveyed by modulated reflected spread spectrum radio waves which have been transmitted by said first antenna, and second receiving means coupled to said second antenna, for

obtaining said requested signals from said transponders, conveyed by modulated reflected spread spectrum radio waves which have been transmitted by said second antenna.

15. The mobile body discrimination apparatus according to claim 14, wherein:

a communication region of said first antenna and a communication region of said second antenna are positioned such as to substantially entirely overlap one another to form a common communication region ; and

said interrogator apparatus further comprises comparator and selector means for comparing a signal received via said first antenna and first receiving means of said interrogator apparatus, conveying a set of data from one of said transponders, with a signal received via said second antenna and said second receiving means of said interrogator apparatus, conveying said set of data from said transponder, to judge that one of said signals is stronger than the other, and for selecting a set of data expressed by said stronger one of said signals to be stored in said memory means.

16. The mobile body discrimination apparatus according to claim 14, wherein:

said plurality of transponders move continuously or intermittently in a fixed direction along a fixed path, and wherein said first antenna and second antenna are located spaced apart from one another, with a communication region of said first antenna and a communication region of said second antenna positioned such as to partially overlap one another, and respectively located in relation to said fixed path such that said communication region of said first antenna extends over a left-side portion of said path and said communication region of said second antenna extends over a right-side portion of said path; and

said control means of said interrogator apparatus comprises means for storing in said memory means a set of data conveyed by a first signal which is transmitted by a first one of said transponders and is received via said first antenna and first receiving means of said interrogator apparatus, while also storing in said memory means of said interrogator apparatus a set of data conveyed by a second signal which is transmitted by a second one of said transponders and is received via said second antenna and second receiving means of said interrogator apparatus entirely or partially

concurrently with said reception of said first signal from said first transponder.

17. The mobile body discrimination apparatus according to claim 14, wherein:

each of said transponders has stored in said memory means thereof a corresponding identification code, and said response timing control section controls said modulator means of said transponder to transmit said identification code together with said response data, by said modulated reflected radio waves;

each of said transponders comprises means for detecting reception of a transmission halt command code by said receiving means of said transponder and for inhibiting further operation of said modulation means of said transponder for a predetermined time duration following reception of said transmission halt command code;

said plurality of transponders move continuously or intermittently in a fixed direction along a fixed path, and wherein a communication region of said first antenna and a communication region of said second antenna are positioned such as to partially overlap one another, and are respectively located in relation to said fixed path such that all of said transponders

first pass through said communication region of said second antenna and the pass through said communication region of said first antenna; and

said control means of said interrogator apparatus comprises means for detecting that said response data and identification code have been successfully acquired from a transponder by said first receiving means or said second receiving means of said interrogator apparatus, and, when said successful acquisition has been detected, for controlling at least one of said first transmitting means and second transmitting means of said interrogator apparatus to transmit said transmission halt command code together with the identification code of the one of said transponders from which said response data was successfully acquired.

18. The mobile body discrimination apparatus according to claim 14, wherein said plurality of transponders move continuously or intermittently in a fixed direction along a fixed path, and wherein a communication region of said first antenna and a communication region of said second antenna are positioned such as to partially overlap one another, and are respectively located on said fixed path at a

succeeding position and at a preceding position with respect to said fixed direction, further comprising:

detector means located adjacent to said fixed path at a position preceding said communication region of said second antenna, for detecting transfer of successive numbers of said transponders along said fixed path and for producing signals indicative of said numbers; and

operation control means provided in said interrogator apparatus, responsive to said signals from said detector means for selectively enabling and inhibiting operation of at least a part of said second transmission means and second receiving means according to said numbers of transponders.

19. The mobile body discrimination apparatus according to claim 18, wherein said operation control means comprises power supply control means operable for selectively connecting and disconnecting a DC power supply of least a part of said second transmission means and second receiving means.

20. The mobile body discrimination apparatus according to claim 14 wherein said first antenna and second antenna are respectively spaced apart and oriented such

that respective communication regions of said first and second antennas partially overlap one another to form a common communication region, and wherein said interrogator apparatus comprises timing control means for alternately establishing, in successive time intervals, a first condition in which said first transmission means of said interrogator apparatus is in operation and said second transmission means is inoperative and a second condition in which said first transmission means is inoperative and said second transmission means is in operation.

21. The mobile body discrimination apparatus according to claim 14, wherein said first antenna is a polarizing antenna having a first type of polarization and said second antenna is a polarizing antenna having a second type of polarization.

22. The mobile body discrimination apparatus according to claim 21, wherein said antenna of each of said transponders is a polarizing antenna, and wherein in approximately half of said plurality of transponders said antenna has said first type of polarization and a remainder of said plurality of transponders has said second type of polarization.

23. The mobile body discrimination apparatus according to claim 21, further comprising timing control means for alternately establishing, in successive time intervals, a first condition in which said first transmission means is in operation and said second transmission means is inoperative and a second condition in which said first transmission means is inoperative and said second transmission means is in operation.

24. A mobile body discrimination apparatus according to claim 21, wherein each of said transponders comprises a first transmitting/receiving system having:

a first polarizing antenna having said first type of polarization;

first receiving means coupled to said first polarizing antenna, for obtaining said transmission start command code from said modulated radio waves transmitted by said interrogator apparatus;

first memory means having data stored therein;

first modulator means controllable for varying a reflection condition of said first polarizing antenna with respect to incident radio waves; and

first response timing control means responsive to reception of said transmission start command code by said first receiving means for controlling said modulator means to vary said reflection condition of said first polarizing antenna according to response data constituted by at least a part of said data of said first memory means, to generate modulated reflected radio waves conveying said response data after a specific delay time has elapsed following reception of said transmission start command code; and a second transmitting/receiving system comprising:

a second polarizing antenna having said second type of polarization;

second receiving means coupled to said second polarizing antenna, for obtaining said transmission start command code from said modulated radio waves transmitted by said interrogator apparatus;

second memory means having data stored therein;

second modulator means controllable for varying a reflection condition of said second polarizing antenna with respect to incident radio waves; and

second response timing control means responsive to reception of said transmission start command code by said second receiving means for controlling said second modulator means to vary said reflection condition of

said second polarizing antenna according to response data constituted by at least a part of said data of said second memory means, to generate modulated reflected radio waves conveying said response data after a specific delay time has elapsed following reception of said transmission start command code.

25. A mobile body discrimination apparatus according to claim 24, wherein said first transmitting/receiving system comprises first rectifier circuit means coupled to said first polarizing antenna, for converting a signal received by said antenna to a supply of electrical power for operating at least a part of all circuits of said transponder, and said second transmitting/receiving system comprises second rectifier circuit means coupled to said second polarizing antenna, for converting a signal received by said second polarizing antenna to a supply of electrical power for operating at least a part of all circuits of said transponder.

26. A mobile body discrimination apparatus according to claim 21, wherein each of said transponders comprises a first polarizing antenna and a second polarizing antenna, and wherein said receiving means of

said transponder is coupled to receive modulated radio signals from said first polarizing antenna and said modulator means of said transponder is coupled to said second polarizing antenna, for varying said reflection condition of said antenna with respect to incident radio waves.

27. A mobile body discrimination apparatus according to claim 26, comprising first rectifier circuit means coupled to said first polarizing antenna, for converting a signal received by said antenna to a supply of electrical power for operating at least a part of all circuits of said transponder, and second rectifier circuit means coupled to said second polarizing antenna, for converting a signal received by said second polarizing antenna to a supply of electrical power for operating at least a part of all circuits of said transponder.

28. A mobile body discrimination apparatus according to claim 21, wherein each of said transponders comprises:

a first polarizing antenna having said first direction of polarization and a second polarizing antenna having said second direction of polarization;

first rectifier circuit means coupled to said first polarizing antenna, for converting a signal received by said first polarizing antenna to a supply of electrical power for operating at least a part of all circuits of said transponder, and second rectifier circuit means coupled to said second polarizing antenna, for converting a signal received by said second polarizing antenna to a supply of electrical power for operating at least a part of all circuits of said transponder;

first receiving means coupled to said first polarizing antenna, for obtaining said transmission start command code and supplying said transmission start command code to said response timing control means;

second receiving means coupled to said second polarizing antenna, for obtaining said transmission start command code and supplying said transmission start command code to said response timing control means;

first modulator means controllable for varying a reflection condition of said first polarizing antenna, and second modulator means controllable for varying a reflection condition of said second polarizing antenna; and

power comparison circuit means for judging which of said first rectifier circuit means and second rectifier circuit means is currently providing a higher level of supply power, and for enabling operation of the one of said first modulator means and second modulator means which is coupled to the same one of said first polarizing antenna and second polarizing antenna as said rectifier circuit means which provides the higher level of supply power while inhibiting operation of the other one of said first modulator means and second modulator means.

29. A mobile body discrimination apparatus according to claim 21, wherein said first type of polarization is a right-handed direction of circular polarization and said second type of polarization is a left-handed direction of circular polarization.

30. A mobile body discrimination system incorporating an interrogator apparatus and a plurality of transponders according to claim 20, with said first antenna and second antenna of said interrogator apparatus spaced apart at respective fixed locations, the system comprising:

conveyer belt transport means for transporting a plurality of load items along a fixed path in a fixed direction such as to pass through said common communication region of said first and second antennas, with each of said transponders being attached to a corresponding one of said load items and with at least a part of said data stored in said memory means of said each transponder being data relating to said corresponding load item.

31. A mobile body discrimination system incorporating an interrogator apparatus and a plurality of transponders according to claim 20, the system including transport means for transporting a plurality of load items along a fixed path in a fixed direction such as to pass through said common communication region of said first and second antennas, with each of said transponders being attached to a corresponding one of said load items and with at least a part of said data stored in said memory means of said each transponder being data relating to said corresponding load item, comprising:

a housing formed of a material which performs shielding of electromagnetic waves and is formed with a central aperture adapted to permit transfer of said

load items by said transport means through said central aperture;

wherein said first antenna and second antenna of said interrogator apparatus are attached within said housing, at respective positions located on the periphery of said central aperture, respectively oriented such as to form said common communication region within said central aperture.

32. A mobile body discrimination system incorporating an interrogator apparatus and a plurality of transponders according to claim 20, with said first and second antenna of said interrogator apparatus spaced apart at respective fixed locations, the system comprising:

a plurality of transport vehicles controllable for transporting respective pluralities of load items along a fixed path in a fixed direction such as to pass through said common communication region of said first and second antennas, with each of said transponders being attached to a corresponding one of said load items and with at least a part of said data stored in said memory means of said each transponder being data relating to said corresponding load item.

33. A mobile body discrimination system incorporating an interrogator apparatus and a plurality of transponders according to claim 20, wherein said interrogator apparatus is adapted to be portable by an individual, the system comprising supporting means for supporting a plurality of articles on one side of a common vertical plane, with each of said transponders being attached to a corresponding one of said articles and with at least a part of said data stored in said memory means of said each transponder being data relating to said corresponding article;

wherein each of said transponders is oriented substantially facing towards said common vertical plane, for thereby enabling said transponders to be successively scanned by manually orienting said antennas of said interrogator apparatus towards said transponders while moving said interrogator apparatus in a direction parallel to said common vertical plane.

34. A mobile body discrimination system incorporating an interrogator apparatus and a plurality of transponders according to claim 20, comprising:

supporting means for supporting a plurality of articles on one side of a common vertical plane, with each of said transponders being attached to a

corresponding one of said articles and each of said transponders oriented substantially facing towards said common vertical plane, and with at least a part of said data stored in said memory means of said each transponder being data relating to said corresponding article; and

a movable supporting mechanism operable for moving said interrogator apparatus in directions parallel to said common vertical plane with said antennas of said interrogator apparatus oriented towards said common vertical plane, for thereby successively scanning said transponders by said interrogator apparatus.

35. A mobile body discrimination apparatus according to claim 1, wherein:

each of said transponders comprises modulator means having a plurality of absorber elements for applying respectively different degrees of absorption of said radio waves reflected by said antenna, response timing control means, selection control means for generating a selection control signal which specifies an arbitrarily determined pair of said absorber elements, and absorber element selector means controlled by said selection control signal to select a pair of said plurality of absorber elements each time

that said response start command code is obtained by said receiving means, and for effecting said variation of said reflection condition of said antenna by selectively connecting the absorber elements constituting said selected pair of absorber elements to said antenna, to thereby perform amplitude modulation of said reflected radio waves with a modulation depth determined by said arbitrarily determined pair of absorber elements; and

said interrogator apparatus comprises data processing means for operating on an output signal produced from said receiving means of said interrogator apparatus for extracting, from said output signal, respective sets of data which have been transmitted by said transponders by modulation utilizing said arbitrarily determined pairs of absorber elements.

36. A mobile body discrimination apparatus according to claim 35, wherein said selected pair of absorber elements are arbitrarily determined by said selection control means of said each transponder, and wherein said data processing means of said interrogator apparatus comprises means for separately extracting respective sets of data which are received concurrently

by said receiving means of said interrogator apparatus and have been transmitted by a plurality of said transponders which select respectively different pairs of said plurality of absorber elements to transmit the corresponding data sets.

37. A mobile body discrimination apparatus according to claim 1, wherein:

said modulator means of each of said transponders comprises a first absorber element for applying a minimum amount of absorption of said incident radio waves, a second absorber element for applying a greater amount of absorption of said incident radio waves than said first absorber element, and a third absorber element for applying a greater amount of absorption of said incident radio waves than said second absorber element, selection control means for generating a selection control signal, and absorber element selector means controlled by said selection control signal to effecting either a first depth of amplitude modulation of reflected radio waves by selectively coupling said first and second absorber elements to said antenna of said transponder or a second depth of amplitude modulation of said reflected radio waves by selectively

coupling said first and third absorber elements to said antenna of the transponder; and

said interrogator apparatus comprises data processing means for operating on an output signal produced from said receiving means of said interrogator apparatus for extracting, from said output signal, respective sets of data which have been transmitted by said transponders by modulation through selective coupling of said first and second absorber elements to said antenna of said transponder and sets of data which have been transmitted by modulation through selective coupling of said first and third absorber elements to said antenna of said transponder.

38. The mobile body discrimination system according to claim 37 wherein said selection by said absorber element selector means of amplitude modulation through selective coupling of said first and second absorber elements to said antenna of said transponder and amplitude modulation through selective coupling of said first and third absorber elements to said antenna of said transponder is arbitrarily determined at each occurrence of data transmission by said transponder.

39. The mobile body discrimination system according to claim 38, wherein each of said transponders further comprises random number generating means controlled to generate a random number in response to each detection of said response start command code by said response timing control means, and absorber element selection control means for operating on said absorber element selector means to determine that, in accordance with said random number, either said amplitude modulation performed by selective coupling of said first and second absorber elements to said antenna of said transponder or said amplitude modulation which is performed by selective coupling of said first and third absorber elements to said antenna.

40. The mobile body discrimination system according to claim 37 wherein said selection control means of each of said transponders comprises means for determining that, when said response start command code is first obtained by said receiving means of said transponder after said transponder has entered a communication region of said antenna of said interrogator apparatus, said amplitude modulation performed by selective coupling of said first and second absorber elements to said antenna of said transponder is applied, to

transmit said response data by said modulated reflected radio waves, and that thereafter during at least a time duration for which said transponder remains within said communication region, said amplitude modulation performed by selective coupling of said first and third absorber elements to said antenna of said transponder is applied, to transmit said response data by said modulated reflected radio waves.

41. The mobile body discrimination apparatus according to claim 37, wherein:

each of said transponders has stored in said memory means thereof an identification code, and said response timing control section controls said modulator means of said transponder to transmit said identification code together with said response data, by said modulated reflected radio waves;

each of said transponders comprises means for detecting reception of a transmission halt command code by said receiving means of said transponder and for inhibiting further operation of said modulation means of said transponder for a predetermined time duration following reception of said transmission halt command code; and

said control means of said interrogator apparatus comprises means for detecting that said response data and identification code have been successfully acquired from a transponder by said receiving means and data processing means of said interrogator apparatus, and, when said successful acquisition has been detected, for controlling at said transmitting means of said interrogator apparatus to transmit said transmission halt command code together with the identification code of the one of said transponders from which said response data was successfully acquired.

42. The mobile body discrimination apparatus according to claim 37, wherein said first, second and third absorber elements apply respective degrees of absorption of 0 db, 10 db and 20 dB.

43. The mobile body discrimination apparatus according to claim 37, wherein:

each of said transponders has stored in said memory means thereof an identification code, and said response timing control section controls said modulator means of said transponder to transmit said identification code together with said response data, by said modulated reflected radio waves;

said selection control means of said transponder determines that said amplitude modulation by selective coupling of said first and third absorber elements to said antenna of said transponder is applied by said modulator means when said identification code is being transmitted and that said amplitude modulation by selective coupling of said first and second absorber elements to said antenna of said transponder is applied by said modulator means when said response data are being transmitted.

44. A mobile body discrimination apparatus according to claim 35 wherein:

each of said transponders has stored in said memory means thereof an identification code, and said response timing control section controls said modulator means of said transponder to transmit said identification code together with said response data, by said reflected phase-shifted radio waves;

each of said transponders comprises means for detecting reception of a transmission halt command code by said receiving means of said transponder and for inhibiting further operation of said modulation means of said transponder for a predetermined time duration

following reception of said transmission halt command code; and

said control means of said interrogator apparatus comprises means for detecting that said response data and identification code have been successfully acquired from a transponder by said receiving means and data processing means of said interrogator apparatus, and, when said successful acquisition has been detected, for controlling said transmitting means of said interrogator apparatus to transmit said transmission halt command code together with the identification code of the one of said transponders from which said response data was successfully acquired.

45. A mobile body discrimination apparatus according to claim 44, wherein:

said plurality of absorber elements of said each transponder comprises at least a first absorber element for applying a minimum amount of absorption of said incident radio waves, a second absorber element for applying a greater amount of absorption of said incident radio waves than said first absorber element, and a third absorber element for applying a greater amount of absorption of said incident radio waves than said second absorber element;

said selection control means of said transponder generates said selection control signal such that said first absorber element and third absorber element are selected to be applied in said amplitude modulation of said reflected radio waves when said identification code is being transmitted, and that said first absorber element and second absorber element are selected to be applied in said amplitude modulation of said reflected radio waves when said response data set is being transmitted.

46. A mobile body discrimination apparatus according to claim 45, wherein

each of said transponders comprises means for processing said response data set prior to transmission thereof, to generate data key information for use in extracting said response data set from a demodulated received signal, and for combining said data key information with said identification code of said transponder to constitute a header which is transmitted immediately prior to said response data set, in response to each said reception of said response start command code by said transponder, and wherein said first absorber element and third absorber element are selected to be applied in said amplitude modulation of

said reflected radio waves when said header is being transmitted; and

said data processing section of said interrogator apparatus comprises means for operating on said output signal from said receiving means of said interrogator apparatus by applying said data key information of said header to correctly extract the contents of a corresponding response data set, when data conflict occurs within said output signal between said corresponding response data set and a response data set which is transmitted by another one of said transponders.

47. A mobile body discrimination apparatus according to claim 1, wherein:

said modulator means of each of said transponders comprises a plurality of phase shifter elements for applying respectively different degrees of phase shift to said radio waves which are reflected by said antenna, phase shifter selection control means, and phase shifter element selector means controlled by said phase shifter selection control means to select a specific pair of said phase shifter elements each time that said response start command code is obtained by said receiving means, and for effecting said variation

of said reflection condition of said antenna of said transponder by selectively coupling respective ones of said selected pair of phase shifter elements to said antenna of said transponder; and

said interrogator apparatus comprises data processing means for operating on an output signal produced from said receiving means of said interrogator apparatus to extract data which have been transmitted by said transponders by modulation utilizing said selected pair of phase shifter elements.

48. The mobile body discrimination system according to claim 47 wherein said selection control means of each of said transponders comprises means for determining that, when said response start command code is first obtained by said receiving means of said transponder after said transponder has entered a communication region of said antenna of said interrogator apparatus, said phase modulation performed by selective coupling of said first and second phase shifter elements to said antenna of said transponder is applied, to transmit said response data by phase modulation of said reflected radio waves, and that thereafter during at least a time duration for which said transponder remains within said communication

region, said phase modulation performed by selective coupling of said first and third phase shifter elements to said antenna of said transponder is applied, to transmit said response data by phase modulation of said reflected radio waves.

49. The mobile body discrimination apparatus according to claim 47, wherein:

each of said transponders has stored in said memory means thereof an identification code, and said response timing control section controls said modulator means of said transponder to transmit said identification code together with said response data, by said reflected phase-shifted radio waves;

each of said transponders comprises means for detecting reception of a transmission halt command code by said receiving means of said transponder and for inhibiting further operation of said modulation means of said transponder for a predetermined time duration following reception of said transmission halt command code; and

said control means of said interrogator apparatus comprises means for detecting that said response data and identification code have been successfully acquired from a transponder by said receiving means and data

processing means of said interrogator apparatus, and, when said successful acquisition has been detected, for controlling said transmitting means of said interrogator apparatus to transmit said transmission halt command code together with the identification code of the one of said transponders from which said response data was successfully acquired.

50. The mobile body discrimination apparatus according to claim 47, wherein each of said transponders further comprises attenuator insertion control means and said modulator means of each of said transponders comprises attenuator means controlled by said attenuator insertion control means to selectively apply a fixed amount of attenuation to said reflected phase-shifted radio waves.

51. The mobile body discrimination system according to claim 50 wherein said attenuator insertion control means of each of said transponders comprises means for determining that, when said response start command code is first obtained by said receiving means of said transponder after said transponder has entered a communication region of said antenna of said interrogator apparatus, said attenuator is applied to

effect attenuation of said phase-shifted reflected radio waves when data are transmitted by said transponder in response to said first reception of said response start command code, and that thereafter during at least a time duration for which said transponder remains within said communication region, no attenuation is applied by said attenuator to said phase-shifted reflected radio waves.

52. A mobile body discrimination apparatus according to claim 1, wherein said rectifier circuit means includes a rectifier element, impedance matching means for transferring said signal received by said antenna to an input terminal of said rectifier element, and a low-pass filter for smoothing a rectified output voltage produced at an output terminal of said rectifier element;

and wherein said rectifier circuit means comprises an impedance adjustment element which is coupled to at least said input terminal of said rectifier element and is adjusted to optimize a degree of rectification efficiency of said rectifier circuit means, by applying compensation for a deviation of an impedance parameter of said rectifier element from a nominal predetermined value of said parameter.

53. The mobile body discrimination apparatus according to claim 52, wherein said rectifier circuit means comprises means for supplying a fixed-amplitude test signal to said impedance matching means in place of said signal from said antenna, for thereby performing said adjustment of said impedance adjustment element by setting said impedance adjustment element in a condition whereby a predetermined minimum level of output power is available from said rectifier circuit means when said test signal is being supplied.

54. The mobile body discrimination apparatus according to claim 52, wherein said rectifier element is a diode, said impedance parameter is a value of inter-terminal capacitance of said diode, and said impedance adjustment element is an adjustable capacitor which is connected in parallel with said input and output terminals of said diode.

55. The mobile body discrimination apparatus according to claim 54, wherein said diode is connected in series between said impedance matching means and said low-pass filter.

56. The mobile body discrimination apparatus according to claim 54, wherein said diode is connected in parallel between a junction point of said impedance matching means and low-pass filter and a ground potential of said rectifier circuit means.

57. The mobile body discrimination apparatus according to claim 54, wherein said diode is implemented as a component of an integrated circuit chip, wherein said integrated circuit chip is mounted in flip-chip configuration on a substrate, and said adjustable capacitor is implemented by a first electrically conductive region which is formed on said substrate and a second electrically conductive region which is disposed above and adjacent to said first conductive region and is adapted to be moved towards said first electrically conductive region by displacement of said integrated circuit chip towards said substrate.

58. The mobile body discrimination apparatus according to claim 57, wherein said first electrically conductive region is a conductive layer portion which is formed on said substrate directly below said integrated circuit chip, said second electrically conductive region is a conductive layer portion which

is formed on an outer face of said integrated circuit chip, said face being oriented opposing said first electrically conductive region, and wherein said adjustment is performed by applying force between said integrated circuit chip and said substrate in a direction such as to displace said integrated circuit chip successively towards said substrate.

59. The mobile body discrimination apparatus according to claim 52, wherein said rectifier element is a diode, said impedance parameter is a value of internal series inductance of said diode, and said impedance adjustment element is an adjustable inductor which is connected in parallel with said input and output terminals of said diode, with respect to high-frequency signals.

60. The mobile body discrimination apparatus according to claim 59, wherein said diode is implemented as a component of an integrated circuit chip wherein said integrated circuit chip is mounted in flip-chip configuration on a substrate, and said adjustable inductor is implemented by a patterned electrically conductive layer formed on said substrate, in the form of an elongated connecting lead having a curved shape

such that a plurality of portions of said connecting lead are disposed adjacent to one another, and connection means attached to said integrated circuit chip and adapted to be brought into contact with respective pairs of said separate portions, to thereby reduce an inductance value of said adjustable inductor, as a result of displacement of said integrated circuit chip towards said substrate.

61. The mobile body discrimination apparatus according to claim 60, wherein:

said shaped connecting lead is formed directly below said integrated circuit chip on said substrate;

said connection means comprises a plurality of protrusions formed of an electrically conductive material and of respectively different heights, disposed protruding from a lower face of said substrate towards said substrate and respectively positioned directly above corresponding ones of said portions of the shaped connecting lead, and

said adjustment is performed by applying force between said integrated circuit chip and said substrate in a direction such as to displace said integrated circuit chip successively towards said substrate.

62. A mobile body discrimination apparatus according to claim 1, wherein said radio waves transmitted by said interrogator apparatus are in the microwave frequency range and wherein each of said transponders is structured as an IC (integrated circuit) card having a substrate with patterned connecting leads formed on an upper face thereof and an integrated circuit chip in bare chip condition, which constitutes respective internal circuits of said transponder and has a plurality of connector elements, which are respectively coupled to said internal circuits, formed thereon, said integrated circuit chip being mounted on said upper face of said substrate;

wherein said IC card comprises:

an antenna connecting lead constituted by a part of said patterned connecting leads, coupled through one of said connector elements to said internal circuits; and

first and second layers of electrically conductive material formed respectively formed on opposite sides of said IC card, having respective slot apertures formed therein, said slot apertures being located in a predetermined position relationship to specific portions of said antenna connecting lead to thereby constitute first and second slot antennas, with each of

said slot antennas functioning independently of the other one thereof as said antenna of said transponder.

63. A mobile body discrimination apparatus according to claim 1, wherein said radio waves transmitted by said interrogator apparatus are in the microwave frequency range and wherein each of said transponders is structured as an IC (integrated circuit) card having a first substrate with patterned connecting leads (formed on an upper face thereof and an integrated circuit chip in bare chip condition, which constitutes respective internal circuits of said transponder and has a plurality of connector elements, which are respectively coupled to said internal circuits, formed thereon, said integrated circuit chip being mounted on said upper face of said first substrate, said IC card comprising:

an antenna connecting lead formed as part of said patterned connecting leads, having a first branch portion and a second branch portion which respectively extend from a junction thereof, each of said first and second branch portions having a length that is determined in accordance with a wavelength of said radio waves transmitted by said interrogator apparatus, and with said antenna connecting lead having a common

portion which extends between said junction and one of said connector elements;

a second substrate formed with an aperture for accommodating said integrated circuit chip and having a lower face thereof fixedly attached to said upper face of said first substrate;

a first layer of electrically conductive material formed over a lower face of said first substrate, having a first slot aperture formed therein, with said first slot aperture located directly over a part of said first branch portion of said antenna connecting lead;

a second layer of electrically conductive material formed over an upper face of said second substrate, having a second slot aperture formed therein, with said second slot aperture located directly above a part of said second branch portion of said antenna connecting lead; and

connection means coupled to one of said connector elements and to each of said first layer of electrically conductive material and second layer of electrically conductive material, for connecting each of said layers to a ground potential of said internal circuits of said transponder;

wherein said first slot aperture in conjunction with said first branch portion of the antenna connecting lead constitutes a first slot antenna and said second slot aperture in conjunction with said second branch portion of the antenna connecting lead constitutes a second slot antenna, whereby each of said first and second slot antennas implements the functions of said antenna of said transponder independently of the other one of said first and second slot antennas.

64. The transponder for a mobile body discrimination apparatus according to claim 63, further comprising a first layer of a dielectric material formed over said first layer of electrically conductive material and a second layer of a dielectric material formed over said second layer of electrically conductive material, with said first and second layers of dielectric material respectively covering said first and second slot apertures.

65. A mobile body discrimination apparatus according to claim 1, wherein said radio waves transmitted by said interrogator apparatus are in the microwave frequency range and wherein each of said transponders is structured as an IC (integrated circuit) card having

a first substrate with patterned connecting leads formed on an upper face thereof and an integrated circuit chip in bare chip condition, which constitutes respective internal circuits of said transponder and has a plurality of connector elements, which are respectively coupled to said internal circuits, formed thereon, said integrated circuit chip being mounted on said upper face of said first substrate;

wherein said integrated circuit chip is manufactured with a ground connecting layer of electrically conductive material, connected to a ground potential of said internal circuits, formed over at least a part of a face of said integrated circuit chip that is opposite to a face which supports said connector elements, and

said IC card comprises:

an antenna connecting lead formed as part of said patterned connecting leads, having a first branch portion and a second branch portion which respectively extend from a junction thereof, each of said first and second branch portions having a length that is determined in accordance with a wavelength of said radio waves transmitted by said interrogator apparatus, and with said antenna connecting lead having a common

portion which extends between said junction and one of said connector elements;

a layer of electrically insulating sealing material formed upon said upper face of said substrate surrounding said integrated circuit chip while leaving at least a part of said ground connecting layer uncovered by said layer of sealing material;

a first layer of electrically conductive material formed over a lower face of said first substrate, having a first slot aperture formed therein, located such as to extend directly below a part of said first branch portion of said antenna connecting lead;

a second layer of electrically conductive material formed over an upper face of said layer of electrically insulating sealing material and said ground connecting layer, having a second slot aperture formed therein, with said second slot aperture located such as to extend directly above a part of said second branch portion of said antenna connecting lead; and

connection means coupled to one of said connector elements and to said first layer of electrically conductive material, for connecting said layer to said ground potential;

wherein said first slot aperture in conjunction with said first branch portion of the antenna

connecting lead constitutes a first slot antenna and said second slot aperture in conjunction with said second branch portion of the antenna connecting lead constitutes a second slot antenna, whereby either one of said first and second slot antennas can implement the functions of said antenna of said transponder independently of the other one of said first and second slot antennas.

66. The transponder for a mobile body discrimination apparatus according to claim 61, further comprising a first layer of a dielectric material formed over said first layer of electrically conductive material and a second layer of a dielectric material formed over said second layer of electrically conductive material, with said first and second layers of dielectric material respectively covering said first and second slot apertures.

67. A mobile body discrimination apparatus according to claim 1, wherein said radio waves transmitted by said interrogator apparatus are in the microwave frequency range and wherein each of said transponders is structured as an IC (integrated circuit) card having a substrate with patterned connecting leads formed on

an upper face thereof and an integrated circuit chip in bare chip condition, which constitutes respective circuits of said transponder and has a plurality of connector elements, which are respectively coupled to said internal circuits, formed thereon, said integrated circuit chip being mounted on said upper face of said substrate;

wherein said IC card comprises:

an antenna chip formed of a block of dielectric material with planar upper and lower faces, mounted on said upper face of said substrate, with a layer of electrically conductive material having a slot aperture formed therein and connected to a ground potential of internal circuits of said integrated circuit chip, formed over said upper face of said block;

an antenna connecting lead, having a first portion formed on said lower face of said antenna chip and a second portion formed on said upper face of said substrate, coupled through one of said connector elements to said internal circuits; and

a layer of electrically conductive material formed over a lower face of said substrate and connected to said ground potential, having a slot aperture formed therein;

wherein said slot apertures are located in a predetermined position relationship to respective portions of said antenna connecting lead to thereby constitute respective slot antennas, and each of said slot antennas is configured to function independently of the other one thereof as said antenna of said transponder.

68. A mobile body discrimination apparatus according to claim 1, wherein said radio waves transmitted by said interrogator apparatus are in the microwave frequency range and wherein each of said transponders is structured as an IC (integrated circuit) card having a first substrate with patterned connecting leads formed on an upper face thereof and an integrated circuit chip in bare chip condition, which constitutes respective internal circuits of said transponder and has a plurality of connector elements, respectively coupled to said internal circuits, formed thereon, said integrated circuit chip being mounted on said upper face of said first substrate;

wherein said IC card comprises:

an antenna chip formed of a block of dielectric material mounted on said upper face of said substrate, said antenna chip being shaped with planar upper and

lower faces and having a first layer of electrically conductive material formed on said upper face thereof and a plurality of connector elements attached to said lower face thereof, said first layer of electrically conductive material having a first slot aperture formed therein, and patterned connecting leads formed on said lower face of said block to constitute a first branch portion and a second branch portion of an antenna connecting lead, with said first and second branch portions extending from a junction thereof which is coupled to a first one of said connector elements and said first branch portion positioned with a part thereof disposed directly below said first slot aperture, each of said first and second branch portions having a length that is determined in accordance with a wavelength of said radio waves transmitted by said interrogator apparatus;

a common portion of said antenna connecting lead, formed on said upper face of said substrate to connect said first connector element of said antenna chip to one of said connector elements of said integrated circuit chip;

a second layer of electrically conductive material, formed over a lower face of said substrate, having a second slot aperture formed therein, with said

second slot aperture positioned directly over a part of said second branch portion of said antenna connecting lead;

first through-hole connection means formed in said substrate, coupled to one of said connector elements and to said first layer of electrically conductive material, for connecting said layer to said ground potential; and

second through-hole connecting means formed in said substrate, and third through-hole connecting means formed in said block of dielectric material, disposed to electrically interconnect said first layer of electrically conductive material of said antenna chip and said second layer of electrically conductive material of said substrate via one of said connector elements of said antenna chip;

wherein said first slot aperture in conjunction with said first branch portion of the antenna connecting lead constitutes a first slot antenna and said second slot aperture in conjunction with said second branch portion of the antenna connecting lead constitutes a second slot antenna, whereby either one of said first and second slot antennas can implement the functions of said antenna of said transponder

independently of the other one of said first and second slot antennas

69. A mobile body discrimination apparatus according to claim 1, wherein said radio waves transmitted by said interrogator apparatus are in the microwave frequency range and wherein each of said transponders is structured as an IC (integrated circuit) card having a substrate and an integrated circuit chip which constitutes respective internal circuits of said transponder and has a plurality of connector elements, which are respectively coupled to said internal circuits, formed thereon, said integrated circuit chip being mounted in bare chip form on an upper face of said substrate;

wherein said IC card comprises:

first and second portions of a patterned layer of electrically conductive material formed over said upper face of said substrate, said first portion connected to said internal circuits and shaped to constitute a co-planar antenna connecting lead of a slot antenna, and said second portion connected to a ground potential of said internal circuits and shaped with a cut-out portion which extends to an edge of said upper face, to

constitute said slot antenna in conjunction with said antenna connecting lead;

whereby said slot antenna has a directivity oriented parallel to said upper face of said substrate.

70. A mobile body discrimination apparatus according to claim 1, wherein said radio waves transmitted by said interrogator apparatus are in the microwave frequency range and wherein each of said transponders is structured as an IC (integrated circuit) card having a substrate and an integrated circuit chip which constitutes respective internal circuits of said transponder and has a plurality of connector elements formed thereon, with respective ones of said connector elements coupled to said internal circuits, with said integrated circuit chip being mounted in bare chip form on an upper face of said substrate;

wherein said IC card comprises:

a first portion of a patterned layer of electrically conductive material that is formed over said upper face of said substrate, said first portion being connected via at least one of said connector elements to a ground potential of said internal circuits and formed with a shaped cut-out region, said

shaped region extending to an outer edge of said upper face; and

a second portion of said patterned layer of electrically conductive material, extending from said integrated circuit chip to a position adjacent to said shaped region, shaped to function as a co-planar antenna connecting lead of a slot antenna, and connected at one end thereof via one of said connector elements to said internal circuits of said transponder; said cut-out portion and said co-planar antenna connecting lead having respective shapes and dimensions determined in accordance with a wavelength of said microwave radio waves such as to constitute said slot antenna.